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Epidemiologic Notes and Reports

Radon Exposure Assessment — Connecticut

In 1985, indoor air radon (radon-222) levels were found to be elevated in households in Pennsylvania (*1*). Following this discovery, the Connecticut Department of Health Services (CDHS) received inquiries from citizens who requested that their household air be tested for the presence of radon. Because information regarding radon exposures in Connecticut did not exist, CDHS initiated a series of surveys/projects to characterize this potential problem.

In the first survey (Connecticut Radon Survey), carried out from 1985 through 1987, indoor radon sampling was done in 202 homes in 44 towns in areas with suspected high potential for radon. Indoor air radon levels in the homes were sampled using alpha-track devices (one per home) placed in the lowest lived-in area of each home for 3 months. Because radon levels are typically highest during the winter, all homes were sampled for radon in December, January, and February. Radon levels ranged from 0.1 picocuries per liter (pCi/L) to 24.6 pCi/L (geometric mean: 1.3 pCi/L) (Table 1). Eleven percent exceeded the Environmental Protection Agency (EPA) maximum exposure guideline of 4 pCi/L.

TABLE 1. Summary of indoor air radon surveys conducted by the Connecticut Department of Health Services

Characteristic	Connecticut Radon Survey (n=202)		EPA-Connecticut Survey (n=1157*)		Household Testing Program (n=3409)	
Bias†	High		Neutral		High	
Survey device	Alpha-track		Charcoal		Charcoal	
Results						
Location of measurement	**% >4 pCi/L§**	**Geometric mean (pCi/L)**	**% >4 pCi/L**	**Geometric mean (pCi/L)**	**% >4 pCi/L**	**Geometric mean (pCi/L)**
Basement	NT¶	NT	19%	2.1	21%	2.1
Lived-in area	11%	1.3	NT	NT	10%	1.3

*Number of detached houses out of 1425 total homes tested.
†Bias toward geologic locations with a higher probability of finding high radon homes.
§Picocuries per liter.
¶Not tested.

Radon: Connecticut — Continued

In the second survey (EPA-Connecticut Survey), EPA provided support for a survey of basement radon levels in Connecticut homes. From December 1986 through early March 1987, charcoal-testing devices were distributed to 1157 houses for placement in the basement or lowest livable area of each house for 2 days. In 168 towns, homes were selected in the order in which homeowners had requested an energy audit from an energy conservation organization. Housing characteristics, air infiltration rate, smoking habits of occupants, and house location were recorded when the devices were placed.

Of the basements tested, 19% exceeded the EPA guideline of 4 pCi/L (Table 1). The percentage of homes with levels >4 pCi/L varied between regions (boundaries defined by the estimated geologic potential for radon presence). The age of the house was the strongest predictor of indoor radon levels, with mean radon concentration levels increasing with the average age of the homes. Based on the results of the EPA-Connecticut survey, CDHS issued an advisory in August 1987 that all Connecticut homeowners should have their houses tested for radon.

In December 1987, CDHS initiated the Household Testing Program (HTP). HTP provided free radon-testing devices and placement instructions to residents living in areas suspected of having high radon levels, measured radon concentrations in selected Connecticut municipalities, and examined the association between basement and living area radon concentrations.

Based on results of the previous two radon surveys and information on terrestrial radiation and bedrock geology, 53 municipalities were initially identified for the HTP. Of these, 38 were selected to participate in the HTP based on the ability of local health departments or other agencies to distribute testing devices. Each municipality was provided with 200 charcoal-testing devices for use in 100 volunteer households. For each home, one charcoal-testing device was placed in the basement or other lowest livable area, and the second device placed in the lowest lived-in area. The measurements detected a consistent 3:2 ratio between basement and living area radon concentrations. In addition, basement radon levels were strongly predictive of levels in lived-in areas ($R^2=0.48$, $p<0.00001$).

Each of the three surveys detected higher radon levels in areas with granitic bedrock and lower radon levels in areas with sedimentary rock. Of all housing characteristics, only two (cinder-block foundation and house age) had statistically significant positive associations with radon levels. Energy-efficient homes did not have higher radon levels.

Alpha-track devices for follow-up long-term testing have been distributed to 340 households with lowest lived-in area radon concentrations >4 pCi/L and/or basement radon concentrations >20 pCi/L.

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Editorial Note: CDHS has collected data on indoor air radon levels in 5036 households. The data from the three Connecticut studies closely agree about both average radon levels detected and the percentage exceeding 4 pCi/L (Table 1). Based on the risk model from the Biological Effects of Ionizing Radiations IV report (*2*), results from the EPA-Connecticut Survey indicate that, in Connecticut, radon exposure may account for 280 excess cases of lung cancer per year.

Radon: Connecticut — Continued

The CDHS studies helped to quantify the magnitude of radon exposure in Connecticut, assisted in establishment of a radon program, and guided subsequent research and public education on radon health risks, screening, and mitigation techniques.

Until 1984, radon was considered a health hazard primarily for uranium and underground mining workers and for persons living in homes built on uranium mill tailing deposits or land reclaimed from phosphate mining. Based on EPA surveys of 1986–1989, however, exposure to radon and its short-lived decay products are estimated to exceed the EPA guideline (4 pCi/L) in >8 million homes located in 25 states and Native American lands (EPA, unpublished data, 1989).

In the United States, 5000–20,000 deaths from radon exposure may be occurring yearly (*3*). For persons who are exposed at the EPA guidance level of 4 pCi/L over a lifetime, overall risk for lung cancer is approximately 1%–3%. Risk for lung cancer from radon exposure is greatest among smokers, although risks for nonsmokers are also substantial (approximately 15 per 1000 exposed). Smoking appears to interact synergistically with radon in causing lung cancer. Consequently, cessation of smoking represents a crucial prevention measure for reducing lung cancer risk, particularly among radon-exposed populations.

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Lung Cancer and Exposure to Radon in Women — New Jersey

In 1985, the New Jersey State Department of Health (NJDOH) initiated an epidemiologic study of lung cancer and exposure to radon in New Jersey women. In collaboration with the New Jersey State Department of Environmental Protection and the National Cancer Institute, NJDOH examined whether exposure to radon in homes is associated with increased lung cancer risk.

This study was based on a previous statewide case-control study of risk for lung cancer. In that study, cases were defined as lung cancer diagnosed in women (n = 994) between August 1982 and September 1983; controls were 995 women selected from drivers' license, Health Care Financing Administration, and death certificate files (*1*). The 1985 radon substudy focused on New Jersey dwellings in which participants had lived for at least 10 years from 10 to 30 years before lung cancer diagnosis or control selection (*2*).

For a 1-year period, radon concentrations in living areas were measured by alpha-track detectors. In basements, 4-day exposures were measured using charcoal canisters to provide rapid screening assessments for current residents, thereby enabling immediate remediation if necessary, and providing alternate data in the event year-long measurements of radon could not be completed. Mean differences in

Radon: New Jersey — Continued

duplicate alpha-track measurements, conducted for about 10% of the residences, were considered sufficiently small to exclude measurement error as a major contributor to exposure misclassification.

Analysis of exposure data by radon concentration for 433 cases and 402 controls found no statistically significant differences (Table 1). However, the trend for increasing risk for lung cancer with increasing radon exposure was statistically significant (Table 1). When cumulative exposure (concentration multiplied by duration) was considered, a similar but not statistically significant trend of increasing risk with increasing exposure was seen (Table 2).

The relative risk coefficient (i.e., the increase in lung cancer risk over background risk per unit of cumulative exposure) was 3.4% (90% confidence limits = 0, 8.0%) per working level month.* In studies of underground miners (*3,4*), for whom the occupational exposures were much higher, the range was 0.5%–4.0% per working level month. Analyses by smoking categories indicated that, for persons who smoke <15 cigarettes a day, the association between radon exposure and lung cancer was strongest.

The data indicated that year-round exposures in living areas were two to five times lower than basement measurements taken during heating season. The difference increased with higher concentrations. For example, the average annual living area radon concentration was generally below 4 pCi/L (the Environmental Protection Agency's maximum exposure guideline) in houses with basement screening results approaching 20 pCi/L (*2*).

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*One hundred seventy hours exposure to any combination of radon daughters in 1 liter of air that results in 1.3×10^5 million electron volts of potential alpha energy.

TABLE 1. Distribution of lung cancer cases and controls, by radon level* — New Jersey radon/female lung cancer case-control study, 1982–1988

	Radon level (pCi/L†)								
	<1.0§		1.0–1.9		2.0–3.9		4.0–11.3		
Category	**No.**	**(%)**	**No.**	**(%)**	**No.**	**(%)**	**No.**	**(%)**	**Total**
Cases	342	(79.0)	67	(15.5)	18	(4.2)	6	(1.4)	433
Controls	324	(80.6)	66	(16.4)	10	(2.5)	2	(0.5)	402
Total	**666**	**(79.8)**	**133**	**(15.9)**	**28**	**(3.4)**	**8**	**(1.0)**	**835**
Adjusted OR¶ (90% CL)	1.0		1.1 (0.8, 1.7)		1.3 (0.6, 2.9)		4.2 (1.0, 17.5)**		

*Year-long living area alpha-track measurements (n = 664). Estimates derived from basement alpha-track or charcoal-canister measurements (n = 171).
†Picocuries per liter.
§Includes persons whose index address was an apartment above the second floor or a trailer.
¶Odds ratios (OR) and 90% confidence limits (CL): estimate of the lung cancer risk associated with exposure to a given level of radon, after adjusting for other factors (e.g., cigarette smoking, age, occupation, and respondent type). Test for trend in OR with increasing radon: p = 0.04.
**OR for radon exposure of >2.0 pCi/L = 1.8 (90% CL = 0.9, 3.5).

Radon: New Jersey — Continued

Editorial Note: Radon is a chemically inert gas produced by the radioactive decay of uranium. The immediate decay products of radon are chemically reactive metals (polonium, bismuth, and lead) that tend to be retained in the lung when inhaled. The polonium decay products emit highly ionizing alpha particles. Studies of underground miners, animals, and dosimetry modeling have shown that radon decay products are lung carcinogens (*3,5*). In particular, epidemiologic studies of miners have shown a strong and consistent dose-response relationship between lung cancer and radon exposure (*3*). However, information on residential risk from exposure to radon has been limited (*3,5*), and other residential studies either have not addressed other risk factors for lung cancer, such as smoking, and/or have not measured radon in the houses of all participants (*6–9*).

The New Jersey study is the first major epidemiologic study of radon exposure and lung cancer that used both measurements of radon levels in homes and detailed smoking histories for participants. NJDOH believes its findings support the use of the studies of miners for risk extrapolations to the residential setting.

An important limitation on the interpretation of this study is the small number of persons who were in the highest radon-exposure categories (*2*). NJDOH also considered other possible biases introduced by reducing the potential study population to persons for whom radon-exposure estimates were collected (*2*).

The relationship between short-term screening measurements and year-round living area measurements requires improved characterization for public policy purposes and clear understanding before remediation decisions are made. When winter and summer short-term measurements are averaged to obtain year-round exposure estimates, overestimations may result (*10*).

NJDOH has recommended that existing actions to reduce radon exposure to the lowest feasible levels should be maintained pending other research, and remedial action should be taken in New Jersey residences where both short- and long-term testing indicate that typical exposures for occupants exceed 4 pCi/L. This recommen-

TABLE 2. Distribution of lung cancer cases and controls, by cumulative radon exposure* — New Jersey radon/female lung cancer case-control study, 1982–1988

	Cumulative radon level (pCi/L-years†)								
	<25		25–49		50–99		100–155		
Category	**No.**	**(%)**	**No.**	**(%)**	**No.**	**(%)**	**No.**	**(%)**	**Total**
Cases	361	(83.4)	56	(12.9)	12	(2.8)	4	(0.9%)	433
Controls	340	(84.6)	52	(12.9)	9	(2.2)	1	(0.2%)	402
Total	**701**	**(84.0)**	**108**	**(12.9)**	**21**	**(2.5)**	**5**	**(0.6%)**	**835**
Adjusted OR§ (90% CL)	1.0		1.2 (0.8, 1.9)		0.9 (0.4, 2.2)		7.2 (1.0, 50.3)¶		

*Cumulative radon exposure during 25 years from 5 to 30 years before case diagnosis or control selection; assumes exposure of 0.6 pCi/L (median for controls) for any of the 25 years during which the person did not live in the index address where the measurements were made.
†Picocuries per liter-years.
§Odds ratios (OR) and 90% confidence limits (CL): estimate of the lung cancer risk associated with exposure to a given cumulative level of radon, after adjusting for other factors (e.g., cigarette smoking, age, occupation, and respondent type). Test for trend in OR with increasing cumulative radon exposure: p=0.09.
¶OR for cumulative radon exposure of >50.0 pCi/L-years=1.4 (90% CL=0.7, 3.0).

Radon: New Jersey — Continued

dation is based on the limited feasibility of remediating residences with radon levels <4 pCi/L. Building code modification to prevent radon entry may be effective in reducing overall population risks from radon exposure (*2*), and appropriate New Jersey legislation has been enacted. Health-care providers in New Jersey should advise their patients, particularly those who smoke, of the health risks associated with radon exposure and should consider recommending indoor radon concentration testing.

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Update: Work-Related Electrocutions Associated with Hurricane Hugo — Puerto Rico

When Hurricane Hugo struck the northeastern corner of Puerto Rico on September 18, 1989, thousands of residents of low-lying and flood-prone areas escaped harm because of timely hurricane warnings and effective evacuation (*1*). In the postimpact phase of the storm, however, other dangers threatened persons making repairs in the devastated areas. Approximately 85% of the island was without power because of damage to power lines and poles. Energized downed power lines presented hazards for electric company repair crews and for members of communities affected by the hurricane. Thus far, six persons (all males) have been electrocuted in separate incidents attributable to hazards resulting from the hurricane (*1*). Five of these deaths were work-related.

In response to a request from the commonwealth epidemiologist, Puerto Rico Department of Health, a Fatal Accident Circumstances and Epidemiology (FACE) team from the National Institute for Occupational Safety and Health (NIOSH), CDC, assisted local health officials in the investigation of the five occupational electrocutions. A brief summary of the cases follows.

Electrocutions — Continued

Case 1. At 12 noon on September 20, a 35-year-old tree trimmer/crew leader was electrocuted when he contacted a dangling, energized power line. The line, believed to be de-energized, was receiving "feedback" electric current from portable emergency generators operated by local businesses.

Case 2. At 3:30 p.m. on September 21, a 42-year-old electric lineman with 19 years' experience was preparing to work on a power line believed to be de-energized. The line, however, was receiving "feedback" current from portable generators in use in the area, and the worker was electrocuted when he touched the line.

Case 3. At 8:45 p.m. on September 22, a 38-year-old electric lineman with 14 years' experience was electrocuted when he contacted a dangling, energized 4,800-volt power line while working in a dark, wooded area.

Case 4. At 8:30 p.m. on September 28, a 30-year-old electric lineman with 6 years' experience was electrocuted while working from a bucket truck at night. He inadvertently activated and was unable to disengage the control lever that regulates movement of the bucket, resulting in movement of the bucket and worker into an adjacent energized power line.

Case 5. At 6:30 p.m. on September 28, a 28-year-old meter-reader who had been assisting a line crew was electrocuted when he touched an energized metal clothesline wire at a private residence. One of the metal poles supporting the clothesline wire was in contact with the metal roof of the house, on which an energized electrical line that had been torn from a pole was lying.

Based on the findings of the FACE investigation, recommendations were made to prevent the occurrence of similar incidents.

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Editorial Note: Maintenance and repair of electric power lines is inherently hazardous, and U.S. electric linemen suffer an average electrocution rate of 33.4 per 100,000 workers per year—more than four times that of electricians, who suffer the second highest rate of electrocutions (8.3 per 100,000 workers) (*2*). This hazard greatly increases when repairs are conducted under conditions of widespread damage to electrical transmission and distribution systems, such as in the aftermath of a natural disaster like Hurricane Hugo. For example, in an effort to restore power as quickly as possible, experienced electric company personnel worked shifts of ≥24 hours, often in darkness and inclement weather. In addition, to expand the work force, electric company retirees and workers whose job responsibilities normally do not involve work near energized lines volunteered to assist in the power restoration effort. These workers may have been insufficiently familiar with appropriate safety precautions.

The use of portable generators to provide emergency power after natural disasters is of particular concern because of the increased potential hazard posed by electric lines assumed to be disconnected or de-energized. At least two of the work-related fatalities reported here were attributable, in part, to this hazard.

To assist in the prevention of similar incidents in the future, the following recommendations were provided by the NIOSH investigators to the Puerto Rico Department of Health and to electric company officials:

Electrocutions — Continued

- Electric company officials must assure that standard safe operating procedures are followed at all times by all employees; these procedures include inspection of each worksite to identify all potential hazards, verification that lines have been de-energized, grounding (on both the line and load sides of the work area) all lines that will be accessed, use of appropriate personal protective equipment (e.g., insulating gloves), and use of adequate portable lighting in low light or darkness.
- Company emergency preparedness plans should be reviewed and revised as necessary based on the experience with Hurricane Hugo and the deaths of these five workers.

Because at least one other (apparently nonoccupational) electrocution occurred in Puerto Rico after the storm, the following recommendations for the prevention of electrocutions were also developed for the community and provided to local officials.

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TABLE I. Summary — cases of specified notifiable diseases, United States

Disease	42nd Week Ending			Cumulative, 42nd Week Ending		
	Oct. 21, 1989	Oct. 22, 1988	Median 1984-1988	Oct. 21, 1989	Oct. 22, 1988	Median 1984-1988
Acquired Immunodeficiency Syndrome (AIDS)	757	U*	376	28,104	24,971	10,632
Aseptic meningitis	334	322	296	7,663	5,478	8,153
Encephalitis: Primary (arthropod-borne & unspec)	25	20	27	681	682	875
Post-infectious	3	2	1	70	106	97
Gonorrhea: Civilian	13,392	14,641	17,095	547,104	590,073	676,972
Military	235	241	422	9,194	9,430	13,533
Hepatitis: Type A	730	563	496	27,869	20,666	18,147
Type B	506	426	477	18,276	18,187	20,755
Non A, Non B	42	54	69	1,912	2,090	2,866
Unspecified	45	40	63	1,847	1,764	3,564
Legionellosis	24	25	25	858	802	620
Leprosy	-	4	4	136	126	188
Malaria	34	22	22	1,040	829	829
Measles: Total†	89	36	25	12,593	2,427	2,574
Indigenous	88	30	22	12,000	2,180	2,180
Imported	1	6	2	593	247	294
Meningococcal infections	34	29	40	2,142	2,311	2,213
Mumps	52	60	55	4,416	3,817	3,817
Pertussis	62	67	67	2,778	2,358	2,358
Rubella (German measles)	1	1	1	375	184	463
Syphilis (Primary & Secondary): Civilian	668	881	617	32,176	32,563	22,535
Military	4	1	2	197	130	134
Toxic Shock syndrome	5	8	9	300	298	298
Tuberculosis	344	411	406	17,001	17,145	17,145
Tularemia	3	3	4	130	160	160
Typhoid Fever	5	11	9	403	322	297
Typhus fever, tick-borne (RMSF)	14	21	[illegible]	572	554	631
Rabies, animal	58	75	[illegible]	3,789	3,543	4,386

TABLE II. Notifiable diseases of low frequency, United States

	Cum. 1989		Cum. 1989
Anthrax	-	Leptospirosis (Hawaii 2)	75
Botulism: Foodborne	21	Plague	4
Infant (La. 1)	15	Poliomyelitis, Paralytic	-
Other	4	Psittacosis	84
Brucellosis (Calif. 2)	71	Rabies, human	1
Cholera	-	Tetanus (Calif. 1)	36
Congenital rubella syndrome	2	Trichinosis	15
Congenital syphilis, ages < 1 year	165		
Diphtheria	3		

*Because AIDS cases are not received weekly from all reporting areas, comparison of weekly figures may be misleading.

TABLE III. Cases of specified notifiable diseases, United States, weeks ending October 21, 1989 and October 22, 1988 (42nd Week)

Reporting Area	AIDS	Aseptic Menin-gitis	Encephalitis		Gonorrhea (Civilian)		Hepatitis (Viral), by type				Legionel-losis	Leprosy
			Primary	Post-in-fectious			A	B	NA,NB	Unspeci-fied		
	Cum. 1989	Cum. 1989	Cum. 1989	Cum. 1989	Cum. 1989	Cum. 1988	Cum. 1989	Cum. 1989	Cum. 1989	Cum. 1989	Cum. 1989	Cum. 1989
UNITED STATES	28,104	7,663	681	70	547,104	560,073	27,869	18,276	1,912	1,847	858	136
NEW ENGLAND	1,148	426	20	2	16,404	17,519	578	862	61	73	57	8
Maine	58	23	5	-	219	336	18	48	6	1	5	-
N.H.	37	47	-	-	142	217	55	48	8	4	2	-
Vt.	11	38	4	-	57	99	34	67	5	-	2	-
Mass.	629	136	6	2	6,324	5,922	163	499	25	52	37	6
R.I.	62	78	-	-	1,165	1,609	38	62	4	9	11	1
Conn.	351	102	5	-	8,497	9,336	270	158	13	7	-	1
MID. ATLANTIC	8,351	925	31	5	69,352	88,633	3,384	2,835	181	205	208	20
Upstate N.Y.	1,153	428	26	4	13,455	12,193	756	550	67	11	70	3
N.Y. City	4,360	139	2	1	31,006	38,165	344	1,095	32	168	31	15
N.J.	1,895	-	3	-	12,468	12,459	390	513	26	5	39	1
Pa.	943	358	-	-	12,423	25,816	1,894	677	56	21	68	1
E.N. CENTRAL	2,182	1,536	250	8	103,818	94,716	1,668	2,183	222	84	249	4
Ohio	411	490	100	3	27,535	21,173	349	388	38	19	108	-
Ind.	309	209	38	3	8,010	7,120	184	346	24	30	51	1
Ill.	972	303	50	2	34,394	28,055	749	576	92	21	16	3
Mich.	379	442	41	-	26,261	30,220	232	539	43	14	40	-
Wis.	111	92	21	-	7,618	8,148	154	334	25	-	34	-
W.N. CENTRAL	666	399	28	4	26,292	23,682	1,127	823	98	22	30	1
Minn.	148	33	1	1	2,849	3,188	139	96	17	4	2	-
Iowa	50	63	10	-	2,225	1,766	113	33	14	5	6	-
Mo.	326	179	3	-	16,155	13,512	565	559	39	7	12	-
N. Dak.	6	12	1	-	108	154	4	21	4	2	1	-
S. Dak.	4	11	4	-	228	410	13	8	8	-	2	-
Nebr.	27	15	5	-	1,198	1,341	69	24	3	2	2	1
Kans.	105	76	4	3	3,529	3,311	224	82	13	2	5	-
S. ATLANTIC	5,705	1,534	142	23	151,327	158,193	2,783	3,557	289	299	112	1
Del.	74	65	1	-	2,641	2,498	43	121	5	8	10	-
Md.	587	196	18	2	17,720	16,547	808	610	24	27	26	-
D.C.	410	20	-	-	9,063	11,742	8	26	2	-	1	-
Va.	378	318	36	3	13,127	11,657	255	251	63	177	7	-
W. Va.	42	78	72	-	1,149	1,096	23	85	9	8	-	-
N.C.	393	176	8	2	22,718	21,754	375	866	76	-	28	1
S.C.	290	34	1	-	13,823	12,506	68	504	3	10	6	-
Ga.	902	118	2	1	29,002	30,058	305	345	11	8	24	-
Fla.	2,629	529	4	15	42,084	50,336	898	749	96	61	10	-
E.S. CENTRAL	625	584	37	2	45,364	44,939	340	1,297	135	12	52	-
Ky.	118	176	12	1	4,393	4,525	100	324	43	5	9	-
Tenn.	200	112	5	-	15,341	15,457	131	679	31	-	30	-
Ala.	188	207	17	-	14,416	13,574	71	190	54	3	12	-
Miss.	119	89	3	1	11,214	11,383	38	104	7	4	1	-
W.S. CENTRAL	2,428	789	62	6	59,191	60,207	3,092	1,802	122	430	42	19
Ark.	64	37	8	-	6,794	6,021	210	63	15	6	1	-
La.	396	67	12	1	12,636	11,895	226	313	14	2	8	-
Okla.	129	66	11	3	5,192	5,756	379	164	30	32	24	-
Tex.	1,839	619	31	2	34,569	36,535	2,277	1,262	63	390	9	19
MOUNTAIN	905	262	13	4	11,962	12,018	3,974	1,198	169	119	46	3
Mont.	15	6	-	-	155	353	79	41	6	3	3	1
Idaho	20	2	-	1	147	283	141	107	12	3	-	-
Wyo.	14	5	-	-	86	171	47	8	2	-	-	-
Colo.	335	126	3	1	2,508	2,657	427	136	45	48	4	-
N. Mex.	78	9	1	-	1,077	1,179	526	163	27	3	4	1
Ariz.	235	88	3	-	4,804	4,352	2,032	469	41	51	21	1
Utah	59	17	1	2	382	442	416	93	22	4	7	-
Nev.	149	9	5	-	2,804	2,581	306	191	14	7	7	-
PACIFIC	6,094	1,218	98	16	63,394	60,166	10,923	3,699	635	603	62	80
Wash.	404	-	2	1	5,203	5,748	2,613	801	169	50	23	7
Oreg.	193	-	-	-	2,516	2,636	1,951	411	65	14	2	1
Calif.	5,326	1,105	83	15	54,413	50,398	5,635	2,364	387	525	34	59
Alaska	16	30	10	-	820	867	566	53	6	4	1	-
Hawaii	155	83	3	-	442	519	158	70	8	10	2	13
Guam	1	5	1	-	78	127	4	-	-	6	-	1
P.R.	1,065	82	2	1	868	1,085	156	197	16	19	-	8
V.I.	26	-	-	-	515	361	-	7	-	-	-	-
Amer. Samoa	-	-	-	-	14	69	19	-	1	-	-	1
C.N.M.I.	-	-	-	-	57	42	2	4	-	1	-	1

N: Not notifiable U: Unavailable C.N.M.I.: Commonwealth of the Northern Mariana Islands

TABLE III. (Cont'd.) Cases of specified notifiable diseases, United States, weeks ending October 21, 1989 and October 22, 1988 (42nd Week)

Reporting Area	Malaria	Measles (Rubeola)					Meningococcal Infections	Mumps		Pertussis			Rubella		
		Indigenous		Imported*		Total									
	Cum. 1989	1989	Cum. 1989	1989	Cum. 1989	Cum. 1988	Cum. 1989	1989	Cum. 1989	1989	Cum. 1989	Cum. 1988	1989	Cum. 1989	Cum. 1988
UNITED STATES	1,040	88	12,000	1	593	2,427	2,142	52	4,416	62	2,778	2,358	1	375	184
NEW ENGLAND	69	3	297	-	38	109	153	-	73	2	312	257	-	6	9
Maine	-	-	-	-	1	7	13	-	-	-	20	11	-	-	-
N.H.	2	-	8	-	7	88	15	-	13	-	6	46	-	4	5
Vt.	2	-	1	-	2	-	7	-	3	-	6	3	-	1	-
Mass.	39	3	42	-	21	3	85	-	48	2	251	162	-	1	3
R.I.	14	-	38	-	3	-	1	-	-	-	11	15	-	-	1
Conn.	12	-	208	-	4	11	32	-	9	-	18	20	-	-	-
MID. ATLANTIC	193	1	696	-	177	872	300	3	397	23	237	169	1	78	14
Upstate N.Y.	27	-	54	-	98	37	108	2	151	15	107	100	1	63	2
N.Y. City	78	-	97	-	15	50	38	-	19	3	9	5	-	15	7
N.J.	52	-	339	-	6	243	68	-	167	-	24	8	-	-	3
Pa.	36	1	206	-	58	542	86	1	60	5	97	56	-	-	2
E.N. CENTRAL	77	66	3,750	-	95	186	277	2	475	3	320	288	-	24	30
Ohio	12	66	1,361	-	35	25	100	-	118	-	45	40	-	3	1
Ind.	12	-	78	-	-	57	28	-	44	-	19	68	-	-	-
Ill.	31	-	1,810	-	1	71	74	-	159	-	103	44	-	19	25
Mich.	14	-	309	-	16	28	54	2	117	2	42	34	-	1	4
Wis.	8	-	182	-	43	4	21	-	37	1	111	73	-	1	-
W.N. CENTRAL	27	1	567	-	11	13	69	7	392	-	165	113	-	6	2
Minn.	8	-	17	-	-	11	14	-	2	-	46	48	-	-	-
Iowa	3	1	11	-	1	-	2	-	40	-	15	22	-	1	-
Mo.	9	-	399	-	-	2	17	-	56	-	92	20	-	4	-
N. Dak.	1	-	-	-	-	-	-	-	-	-	2	11	-	-	-
S. Dak.	1	-	-	-	-	-	7	-	-	-	1	6	-	-	-
Nebr.	2	-	108	-	2	-	18	-	5	-	6	-	-	-	-
Kans.	3	-	132	-	8	-	11	7	289	-	3	7	-	1	2
S. ATLANTIC	181	16	578	-	58	393	374	13	786	7	306	217	-	10	17
Del.	7	-	42	-	1	-	2	-	2	-	1	7	-	-	-
Md.	34	-	63	-	36	14	67	6	393	1	65	36	-	2	1
D.C.	10	-	36	-	4	-	16	1	127	-	2	1	-	-	-
Va.	37	-	20	-	3	200	43	3	117	-	33	21	-	-	11
W. Va.	2	-	53	-	-	6	12	-	14	2	30	8	-	-	-
N.C.	20	-	185	-	3	4	53	1	32	-	66	61	-	1	-
S.C.	10	15	18	-	-	-	27	1	32	-	-	1	-	-	-
Ga.	10	-	1	-	1	-	64	-	29	4	41	36	-	-	2
Fla.	51	-	160	-	10	169	91	1	40	-	68	47	-	7	3
E.S. CENTRAL	14	-	239	-	4	69	71	3	213	3	127	93	-	3	2
Ky.	-	-	40	-	4	35	39	-	9	-	1	12	-	-	-
Tenn.	5	-	148	-	-	-	7	3	68	2	50	29	-	2	2
Ala.	6	-	50	-	-	-	20	-	29	1	71	48	-	1	-
Miss.	3	-	1	-	-	34	5	N	N	-	5	4	-	-	-
W.S. CENTRAL	59	1	3,146	-	66	17	152	19	1,415	9	326	168	-	50	10
Ark.	-	-	3	-	19	1	11	3	144	5	27	22	-	-	3
La.	2	-	11	-	-	-	38	9	625	1	19	17	-	5	-
Okla.	9	1	127	-	-	8	23	4	192	3	52	61	-	1	1
Tex.	48	-	3,005	-	47	8	80	3	454	-	228	68	-	44	6
MOUNTAIN	26	1	373	1	45	145	64	2	187	7	562	652	-	36	6
Mont.	1	-	12	-	1	29	2	-	4	2	35	2	-	1	-
Idaho	2	-	6	1§	4	1	2	-	18	-	59	315	-	32	-
Wyo.	1	-	-	-	-	-	-	-	8	-	-	2	-	2	-
Colo.	6	-	79	-	18	115	20	2	29	-	49	21	-	-	2
N. Mex.	4	-	16	-	15	-	2	N	N	1	29	46	-	-	-
Ariz.	9	-	141	-	4	-	25	-	105	3	368	236	-	-	-
Utah	-	-	114	-	-	-	5	-	16	1	21	27	-	-	3
Nev.	3	1	5	-	3	-	8	-	7	-	1	1	-	1	1
PACIFIC	394	-	2,254	-	99	623	682	3	478	8	423	421	-	162	94
Wash.	28	-	31	-	18	7	74	3	42	5	176	105	-	-	-
Oreg.	20	-	12	-	48	8	46	N	N	-	11	44	-	3	-
Calif.	336	-	2,192	-	23	594	551	-	417	3	215	207	-	136	64
Alaska	3	-	1	-	-	2	9	-	2	-	1	8	-	-	-
Hawaii	7	-	18	-	10	12	2	-	17	-	21	57	-	23	30
Guam	3	U	-	U	-	1	-	U	4	U	1	-	U	-	1
P.R.	1	-	824	-	-	190	6	-	8	-	4	15	-	8	3
V.I.	-	U	4	U	-	-	-	U	16	U	-	-	U	-	-
Amer. Samoa	-	U	-	U	-	-	-	U	2	U	-	-	U	-	-
C.N.M.I.	-	U	-	U	-	-	-	U	6	U	-	-	U	-	-

*For measles only, imported cases includes both out-of-state and international importations.

N: Not notifiable U: Unavailable †International §Out-of-state

TABLE III. (Cont'd.) Cases of specified notifiable diseases, United States, weeks ending October 21, 1989 and October 22, 1988 (42nd Week)

Reporting Area	Syphilis (Civilian) (Primary & Secondary)		Toxic-shock Syndrome	Tuberculosis		Tula-remia	Typhoid Fever	Typhus Fever (Tick-borne) (RMSF)	Rabies, Animal
	Cum. 1989	Cum. 1988	Cum. 1989	Cum. 1989	Cum. 1988	Cum. 1989	Cum. 1989	Cum. 1989	Cum. 1989
UNITED STATES	32,176	32,563	300	17,001	17,145	130	403	572	3,789
NEW ENGLAND	1,380	934	15	505	450	2	34	8	8
Maine	11	12	3	25	20	-	-	-	2
N.H.	11	6	2	23	8	-	-	-	1
Vt.	1	3	-	8	4	-	-	-	-
Mass.	409	344	5	270	261	2	23	4	2
R.I.	26	29	2	53	36	-	5	1	-
Conn.	922	540	3	126	121	-	6	3	3
MID. ATLANTIC	5,639	8,022	47	3,460	3,440	2	116	59	623
Upstate N.Y.	731	469	9	270	457	1	32	13	52
N.Y. City	2,853	5,690	3	1,970	1,888	-	51	3	-
N.J.	1,152	779	11	651	540	-	25	23	21
Pa.	903	1,084	24	569	555	1	8	20	550
E.N. CENTRAL	1,476	944	49	1,739	1,882	3	46	63	108
Ohio	121	86	15	295	349	-	9	35	10
Ind.	52	48	7	132	191	1	4	19	2
Ill.	668	425	11	805	816	-	22	7	28
Mich.	511	339	16	406	441	1	6	2	24
Wis.	124	48	-	101	85	1	5	-	44
W.N. CENTRAL	266	190	39	434	430	49	7	79	487
Minn.	47	17	11	86	73	-	2	-	107
Iowa	29	18	6	44	43	-	2	2	110
Mo.	138	121	10	197	215	36	2	69	56
N. Dak.	2	2	-	12	15	-	-	1	53
S. Dak.	1	-	4	25	26	6	-	5	73
Nebr.	21	26	5	18	12	3	-	1	43
Kans.	28	6	3	52	46	4	1	11	45
S. ATLANTIC	11,508	11,443	23	3,588	3,639	6	36	197	1,136
Del.	168	87	1	31	36	-	2	1	29
Md.	645	586	1	315	353	2	8	15	310
D.C.	649	565	1	148	162	-	2	-	2
Va.	465	359	4	292	329	4	7	13	212
W. Va.	14	35	-	60	62	-	-	2	45
N.C.	880	636	6	446	388	-	2	105	7
S.C.	696	588	4	409	399	-	2	37	177
Ga.	2,099	2,046	3	565	590	-	3	21	203
Fla.	5,882	6,541	3	1,332	1,320	-	9	3	151
E.S. CENTRAL	2,400	1,626	8	1,329	1,407	7	3	64	309
Ky.	46	53	2	320	313	1	1	14	124
Tenn.	1,048	709	3	427	416	5	1	35	75
Ala.	731	474	2	377	430	-	1	6	106
Miss.	575	390	1	205	248	1	-	9	4
W.S. CENTRAL	4,793	3,501	23	2,058	2,173	39	15	74	512
Ark.	309	193	2	209	248	28	-	19	68
La.	1,188	681	-	269	268	-	1	-	11
Okla.	93	127	12	179	206	11	1	42	83
Tex.	3,203	2,500	9	1,401	1,451	-	13	13	350
MOUNTAIN	666	650	42	374	494	15	10	24	239
Mont.	1	3	-	11	19	1	-	14	70
Idaho	1	2	3	22	18	-	-	4	11
Wyo.	8	1	2	-	5	2	-	2	74
Colo.	58	85	9	19	89	3	2	3	20
N. Mex.	25	43	5	72	91	2	1	1	20
Ariz.	255	128	10	176	204	-	6	-	25
Utah	14	14	9	30	18	6	1	-	8
Nev.	306	374	4	38	50	1	-	-	11
PACIFIC	4,048	5,253	54	3,504	3,230	7	137	4	367
Wash.	360	192	4	191	182	-	9	-	-
Oreg.	189	243	-	109	127	4	6	1	-
Calif.	3,494	4,781	49	3,015	2,758	2	113	3	301
Alaska	5	11	-	42	36	1	-	-	66
Hawaii	10	26	1	147	127	-	9	-	-
Guam	4	3	-	42	26	-	1	-	-
P.R.	438	576	-	229	188	-	8	-	59
V.I.	8	1	-	4	6	-	1	-	-
Amer. Samoa	-	-	-	2	4	-	-	-	-
C.N.M.I.	7	1	-	12	23	-	-	-	-

U: Unavailable

TABLE IV. Deaths in 121 U.S. cities,* week ending October 21, 1989 (42nd Week)

Reporting Area	All Causes, By Age (Years)						P&I**
	All Ages	>65	45-64	25-44	1-24	<1	Total
NEW ENGLAND	648	450	119	43	11	25	54
Boston, Mass.	196	119	47	15	3	12	19
Bridgeport, Conn.§	50	37	9	3	1	-	4
Cambridge, Mass.	18	15	3	-	-	-	2
Fall River, Mass.	22	15	7	-	-	-	1
Hartford, Conn.	60	38	6	7	4	5	3
Lowell, Mass.	22	18	3	-	1	-	-
Lynn, Mass.	17	12	5	-	-	-	-
New Bedford, Mass.	21	18	1	2	-	-	-
New Haven, Conn.	47	35	5	4	1	2	7
Providence, R.I.	49	34	9	4	-	2	2
Somerville, Mass.	9	7	1	1	-	-	1
Springfield, Mass.	50	34	10	3	-	3	6
Waterbury, Conn.	31	25	4	2	-	-	5
Worcester, Mass.	56	43	9	2	1	1	4
MID. ATLANTIC	2,753	1,753	536	322	63	79	123
Albany, N.Y.	50	35	7	5	1	2	3
Allentown, Pa.	18	16	1	1	-	-	-
Buffalo, N.Y.§	102	69	19	9	2	3	5
Camden, N.J.	42	28	7	3	1	3	-
Elizabeth, N.J.	22	12	8	2	-	-	-
Erie, Pa.†	41	27	10	3	-	1	5
Jersey City, N.J.	62	34	15	12	-	1	2
N.Y. City, N.Y.	1,429	888	276	197	30	38	42
Newark, N.J.	57	23	12	17	-	5	12
Paterson, N.J.	26	15	6	5	-	-	4
Philadelphia, Pa.	393	233	99	33	20	8	23
Pittsburgh, Pa.†	77	57	13	5	1	1	4
Reading, Pa.	33	32	1	-	-	-	4
Rochester, N.Y.	131	91	20	12	2	6	8
Schenectady, N.Y.	33	27	4	2	-	-	2
Scranton, Pa.†	24	21	3	-	-	-	2
Syracuse, N.Y.	114	73	20	11	3	7	3
Trenton, N.J.	43	32	7	1	-	3	2
Utica, N.Y.	22	14	4	1	3	-	2
Yonkers, N.Y.	34	26	4	3	-	1	-
E.N. CENTRAL	2,456	1,625	502	182	66	80	125
Akron, Ohio	86	63	14	6	1	2	12
Canton, Ohio	40	31	8	1	-	-	4
Chicago, Ill.§	564	362	125	45	10	22	16
Cincinnati, Ohio	152	99	33	8	6	6	13
Cleveland, Ohio	184	112	40	16	8	8	11
Columbus, Ohio	157	104	32	10	6	4	2
Dayton, Ohio	116	69	26	12	5	4	9
Detroit, Mich.	250	147	54	29	8	12	11
Evansville, Ind.	40	24	11	3	1	1	1
Fort Wayne, Ind.	56	43	10	2	-	1	3
Gary, Ind.	24	12	9	1	2	-	1
Grand Rapids, Mich.	84	56	16	7	2	3	13
Indianapolis, Ind.	171	105	39	13	9	5	1
Madison, Wis.	40	25	8	4	2	1	3
Milwaukee, Wis.	141	113	21	5	-	2	3
Peoria, Ill.	52	44	5	1	-	2	3
Rockford, Ill.	49	32	11	5	-	1	5
South Bend, Ind.	82	65	11	5	-	1	4
Toledo, Ohio	117	80	21	7	6	3	6
Youngstown, Ohio	51	39	8	2	-	2	4
W.N. CENTRAL	817	575	146	51	19	26	42
Des Moines, Iowa	57	27	16	7	5	2	5
Duluth, Minn.	23	16	3	3	1	-	2
Kansas City, Kans.§	82	60	15	6	1	-	2
Kansas City, Mo.	103	74	15	6	3	5	3
Lincoln, Nebr.	45	31	13	1	-	-	4
Minneapolis, Minn.	143	105	26	6	3	3	10
Omaha, Nebr.	78	63	10	3	-	2	3
St. Louis, Mo.	171	116	29	12	4	10	11
St. Paul, Minn.	60	48	7	2	-	3	2
Wichita, Kans.	55	35	12	5	2	1	-

Reporting Area	All Causes, By Age (Years)						P&I**
	All Ages	>65	45-64	25-44	1-24	<1	Total
S. ATLANTIC	1,322	768	243	184	68	58	59
Atlanta, Ga.	171	77	47	25	5	17	2
Baltimore, Md.	226	141	23	28	29	5	20
Charlotte, N.C.§	75	48	18	8	-	1	5
Jacksonville, Fla.	121	72	24	13	6	6	6
Miami, Fla.	155	74	40	28	7	5	1
Norfolk, Va.	68	49	10	3	2	4	3
Richmond, Va.	85	56	18	5	2	4	5
Savannah, Ga.	45	35	6	3	-	1	5
St. Petersburg, Fla.	63	51	6	1	1	4	6
Tampa, Fla.	80	50	13	11	3	3	2
Washington, D.C.	207	96	33	57	13	8	4
Wilmington, Del.	26	19	5	2	-	-	-
E.S. CENTRAL	673	438	150	52	16	17	29
Birmingham, Ala.	108	56	31	13	3	5	1
Chattanooga, Tenn.	58	48	5	3	2	-	3
Knoxville, Tenn.	73	48	16	5	1	3	4
Louisville, Ky.	98	65	24	5	1	3	2
Memphis, Tenn.	109	69	27	9	2	2	11
Mobile, Ala.	60	44	11	2	3	-	1
Montgomery, Ala.	41	32	6	2	-	1	1
Nashville, Tenn.	126	76	30	13	4	3	6
W.S. CENTRAL	1,759	1,077	377	191	62	52	89
Austin, Tex.	52	32	10	6	1	3	5
Baton Rouge, La.	44	28	9	2	1	4	-
Corpus Christi, Tex.	37	23	9	2	1	2	4
Dallas, Tex.	187	102	45	25	11	4	5
El Paso, Tex.	76	42	19	8	3	4	8
Fort Worth, Tex	98	59	18	11	2	8	6
Houston, Tex.§	734	436	169	89	24	16	18
Little Rock, Ark.	77	50	17	6	3	1	3
New Orleans, La.	89	48	21	14	3	3	-
San Antonio, Tex.	202	142	32	19	7	2	26
Shreveport, La.	59	35	12	6	3	3	6
Tulsa, Okla.	104	80	16	3	3	2	8
MOUNTAIN	647	438	113	54	19	22	27
Albuquerque, N. Mex.	76	53	12	7	3	1	1
Colo. Springs, Colo.	46	34	7	3	1	1	10
Denver, Colo.	120	83	18	13	1	5	4
Las Vegas, Nev.	86	53	21	7	3	1	2
Ogden, Utah	28	25	2	1	-	-	2
Phoenix, Ariz.	125	78	23	13	3	8	5
Pueblo, Colo.	30	20	7	2	1	-	2
Salt Lake City, Utah	34	19	5	3	3	4	-
Tucson, Ariz.	102	73	18	5	4	2	1
PACIFIC	1,967	1,286	339	202	72	56	122
Berkeley, Calif.	8	6	1	1	-	-	2
Fresno, Calif.	94	65	16	2	5	6	6
Glendale, Calif.	28	23	5	-	-	-	-
Honolulu, Hawaii	54	41	9	1	-	3	5
Long Beach, Calif.	73	41	18	8	3	3	12
Los Angeles Calif.	542	337	95	69	28	6	16
Oakland, Calif.	69	38	8	15	5	3	3
Pasadena, Calif.	31	23	3	3	1	1	2
Portland, Oreg.	139	101	23	8	2	5	6
Sacramento, Calif.	171	111	33	10	9	8	21
San Diego, Calif.	176	104	31	26	5	7	11
San Francisco, Calif.	135	78	22	28	2	4	4
San Jose, Calif.	182	130	35	10	4	3	18
Seattle, Wash.	165	113	28	16	7	1	3
Spokane, Wash.	60	43	7	4	1	4	9
Tacoma, Wash.	40	32	5	1	-	2	4
TOTAL	13,042††	8,410	2,525	1,281	396	415	670

*Mortality data in this table are voluntarily reported from 121 cities in the United States, most of which have populations of 100,000 or more. A death is reported by the place of its occurrence and by the week that the death certificate was filed. Fetal deaths are not included.

**Pneumonia and influenza.

†Because of changes in reporting methods in these 3 Pennsylvania cities, these numbers are partial counts for the current week. Complete counts will be available in 4 to 6 weeks.

††Total includes unknown ages.

§Data not available. Figures are estimates based on average of past available 4 weeks.

Electrocutions – Continued

- A comprehensive electric safety education program should be instituted, emphasizing the hazards posed by downed power lines, by "feedback" energy in presumably de-energized lines, and by metal objects in the vicinity of utility lines. All power lines should be treated as energized and potentially dangerous.
- Automatic disconnect devices that prevent "feedback" electricity from generators should be installed in all locations where portable emergency generators are likely to be used.
- If automatic disconnect devices are unavailable when portable emergency generators are used, main circuit breakers must be placed in the "off" position or main fuse links pulled to isolate the energized circuit from the community utility system.

These recommendations may be applicable to other areas affected by Hurricane Hugo and by other disasters that involve widespread destruction of electric power lines and distribution systems. NIOSH has notified local officials in the U.S. Virgin Islands and the states affected by Hurricane Hugo of the results of this FACE investigation and has provided them with appropriate recommendations.

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Progress in Chronic Disease Prevention

Chronic Disease Reports: Deaths from Colorectal Cancer – United States, 1986

In 1986, 55,811 persons died with an underlying diagnosis of cancer of the colon, rectum, or anus (i.e., colorectal cancer) (*International Classification of Diseases, Ninth Revision* [ICD-9], codes 153.0–154.8), accounting for 12% of cancer deaths in the United States. Colorectal cancer followed lung cancer as the second leading cause of cancer death among males and followed breast and lung cancer as the third leading cause of cancer death among females (*1*).

In 1986, 41% of deaths from colorectal cancer occurred in persons aged 60–74 years, and 44% in persons aged ≥75 years. When adjusted for age, colorectal cancer mortality was 44% higher in males than in females and 15% higher in blacks than in whites (*1*).

The highest rates of colorectal cancer mortality in 1986 (age adjusted to the 1986 U.S. population) occurred in the northeastern and east north central states and in the District of Columbia, Maryland, and Iowa (Tables 1 and 2, Figure 1). Wyoming had the lowest rate (16.2 per 100,000), and the District of Columbia the highest (32.1 per 100,000).

Reported by: Div of Surveillance and Epidemiologic Studies, Epidemiology Program Office; Div of Nutrition, Center for Chronic Disease Prevention and Health Promotion, CDC.

Editorial Note: From 1979 to 1986, age-adjusted rates of colorectal cancer death declined by 7% (*2*). In contrast, since the early 1970s, the incidence of colorectal cancer has increased (*1*). Between 1974 and 1985, overall 5-year survival with

Colorectal Cancer — Continued

CHRONIC DISEASE REPORTS: COLORECTAL CANCER, TABLE 1. Mean age-adjusted colorectal cancer mortality, by area — United States, 1986

Area	Deaths	Rate per 100,000	Rank by rate
Alabama	848	21.0	36
Alaska	34	16.9	50
Arizona	597	18.0	47
Arkansas	514	18.9	45
California	5140	21.0	35
Colorado	510	20.2	40
Connecticut	848	24.5	14
Delaware	144	23.8	16
District of Columbia	210	32.1	1
Florida	3500	21.7	30
Georgia	1039	20.2	41
Hawaii	174	19.4	43
Idaho	189	21.0	37
Illinois	2946	25.6	12
Indiana	1412	25.9	10
Iowa	845	24.8	13
Kansas	601	21.7	29
Kentucky	877	23.7	17
Louisiana	856	22.8	22
Maine	334	25.8	11
Maryland	1067	27.2	4
Massachusetts	1740	26.3	8
Michigan	1968	22.8	23
Minnesota	982	22.2	26
Mississippi	504	19.7	42
Missouri	1295	22.4	24
Montana	172	21.5	32
Nebraska	416	23.0	21
Nevada	181	23.1	19
New Hampshire	265	26.1	9
New Jersey	2182	27.1	5
New Mexico	215	18.0	48
New York	5228	27.3	3
North Carolina	1285	21.5	33
North Dakota	152	21.2	34
Ohio	2872	26.4	7
Oklahoma	746	22.2	28
Oregon	592	20.7	38
Pennsylvania	3664	26.6	6
Rhode Island	333	28.7	2
South Carolina	559	19.1	44
South Dakota	190	23.4	18
Tennessee	1043	21.6	31
Texas	2440	17.9	49
Utah	203	18.2	46
Vermont	119	22.4	25
Virginia	1203	23.9	15
Washington	877	20.6	39
West Virginia	460	22.2	27
Wisconsin	1183	23.1	20
Wyoming	57	16.2	51
Total	**55,811**	**23.1**	

Colorectal Cancer — Continued

colorectal cancer was 54% (*1*); survival was estimated at 83% for disease diagnosed at the localized stage and 52% at the regional stage but only 6% at the distant stage (*1*). At each stage, survival was higher among whites than among blacks (*1*).

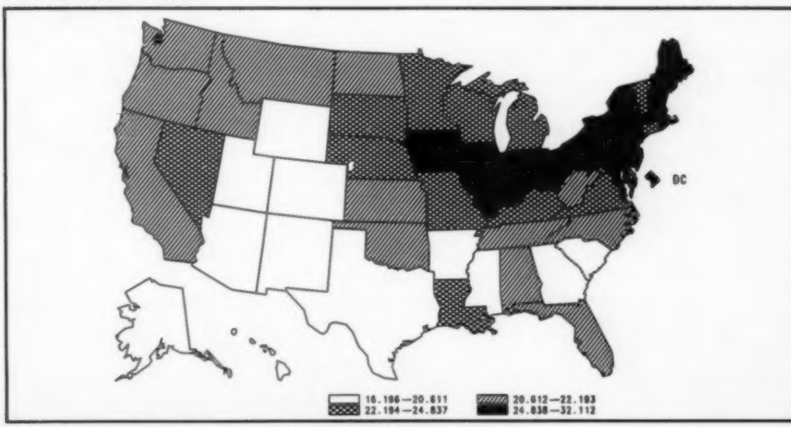
Several risk factors for colorectal cancer have been investigated, although few have been firmly established. Potential nutritional risk factors that have been examined include high consumption of calories, total fat, animal fat, and unsaturated fat (*3–6*); low consumption of vitamin D and calcium (*7*), fruit, vegetables, cruciferous vegetables (*3*), and dietary fiber (*3,8*); and both low and high levels of serum

CHRONIC DISEASE REPORTS: COLORECTAL CANCER, TABLE 2. Colorectal cancer (ICD-9 153–154) indices — United States, 1986

Index	No.	Rate per 100,000
Mortality		
Underlying cause mean	55,811	23.1
Multiple cause*	66,538	27.6
Hospitalizations†	195,785	81.2
Years of potential life lost before age 65§	133,321	55.3

*NCHS. Vital statistics mortality data, multiple cause of death detail, 1986 [machine-readable public-use data tape]. Hyattsville, Maryland: US Department of Health and Human Services, Public Health Service, 1988 (ICD-9 153.0–154.8).
†NCHS. National Hospital Discharge Survey, 1987 [machine-readable public-use data tape]. Hyattsville, Maryland: US Department of Health and Human Services, Public Health Service, 1987 (ICD-9 153.0–154.8).
§Calculated from NCHS. 1986 Underlying cause of death [machine-readable public-use data tape]. Hyattsville, Maryland: US Department of Health and Human Services, Public Health Service, 1988 (ICD-9 153.0–154.8).

CHRONIC DISEASE REPORTS: COLORECTAL CANCER, FIGURE 1. Mean annual age-adjusted colorectal cancer mortality rates per 100,000 population, by quartile — United States, 1986*



*U.S. standard age distribution. See *MMWR* 1989;38:191.

Colorectal Cancer – Continued

cholesterol (*9,10*). Evidence supports a role for high dietary fat intake in the development of colorectal cancer and suggests a protective role for fruits and vegetables, although the particular nutrients or food substances responsible for this effect are uncertain. Obesity and high caloric intake may increase the risk for colorectal cancer (*3*), and occupational or recreational exercise may lower risk (*11,12*).

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Trends in Colorectal Cancer Incidence – United States, 1973–1986

In 1973, the National Cancer Institute (NCI) initiated the Surveillance, Epidemiology, and End Results (SEER) Program,* a population-based tumor registry reporting system for cancer incidence and survival. SEER receives reports from five states and four metropolitan areas† representing approximately 10% of the U.S. population. This report, based on SEER data, describes trends in the incidence of cancer of the colon and rectum (colorectal cancer) during 1973–1986 using the *International Classification of Diseases for Oncology* (ICD-O) categories 153.0–154.1 and 159.0 (*1*). Rates are age-adjusted by the direct method to the 1970 U.S. population.

From 1973 through 1986 (*2*), the annual incidence rate per 100,000 population for colorectal cancer increased 9.4%. The increase in the estimated annual percent change (EAPC) was 0.7%. Statistically significant increases occurred for all races combined, for whites and blacks, and for males and females (Table 1). In 1986, the incidence rates for blacks and whites were similar, while the rate for males was higher than that for females (Figure 1).

*SEER participants were selected for their ability to maintain population-based cancer reporting systems and for the unique population subgroups in each area rather than for demographic representation of the U.S. population.

†Connecticut, Hawaii, Iowa, New Mexico, and Utah; Atlanta, Detroit, San Francisco/Oakland, and Seattle/Puget Sound.

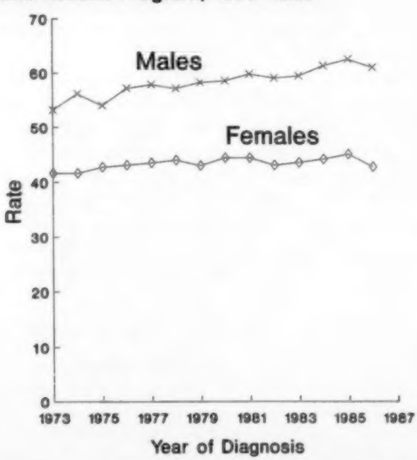
Colorectal Cancer Trends — Continued

TABLE 1. Trends in incidence rates for cancer of the colon and rectum (ICD-O 153.0–154.1 and 159.0), by patient sex, race, age, and period of diagnosis — United States, 1973–1986

	Rate*		EAPC†		
Characteristic	**1973**	**1986**	**1973–1986**	**1975–1979**	**1982–1986**
Total	**46.5**	**50.5**	**0.7§**	**0.9§**	**0.8**
Male	53.2	61.1	1.0§	1.5§	1.2§
Female	41.6	42.8	0.4§	0.4	0.2
White	**46.8**	**50.3**	**0.7§**	**0.8**	**0.6**
Male	54.2	61.4	1.0§	1.5§	1.1
Female	41.6	42.4	0.3§	0.2	0.0
Black	**41.6**	**50.7**	**1.7§**	**1.8**	**0.0**
Male	42.4	55.8	2.0§	1.7	–0.1
Female	40.6	46.9	1.5§	2.3	0.0
Age <65 years	**18.4**	**19.5**	**0.4§**	**0.4**	**1.8§**
Male	19.6	22.9	1.0§	0.7	3.0§
Female	17.3	16.4	–0.3§	0.1	0.4
Age ≥65 years	**302.4**	**333.5**	**0.9§**	**1.1§**	**0.2**
Male	359.6	409.5	1.1§	1.9§	0.3
Female	264.0	283.7	0.7§	0.5§	0.1

*Per 100,000 persons and age-adjusted to the 1970 U.S. standard population.
†Estimated annual percent change.
§The EAPC is significantly different from zero (p<0.05).

FIGURE 1. Colorectal cancer rates,* by year and sex of patient — Surveillance, Epidemiology, and End Results Program, 1973–1986



*Rates per 100,000 persons, age-adjusted to the 1970 U.S. population.

Colorectal Cancer Trends — Continued

To evaluate recent changes in the incidence rates and in the rate of change, the EAPC for 1982–1986 was compared with that for 1975–1979 (Table 1). During this period, only the rates for males of all races combined had a statistically significant increase.

Colorectal cancer is primarily a cancer of the older population—in 1982–1986, the median age at diagnosis was 71 years for colon and 69 years for rectal cancer (*2*). Risk for colorectal cancer increased with age. For example, in 1982–1986, the incidence rate for 30–34-year-olds was 2.9 per 100,000, compared with 531.6 per 100,000 for persons aged ≥85 years.

The segment of the colon most commonly designated as the primary site of origin was the sigmoid (1986 incidence rate of 13.1 per 100,000); from 1973 to 1986, the incidence of cancer of the sigmoid increased 14%. The increased incidence of cancer of the sigmoid may be due to early detection, although specific information on diagnostic methods is not available.

Reported by: LA Gloeckler Ries, MS, BK Edwards, PhD, EJ Sondik, PhD, Surveillance Program, Div of Cancer Prevention and Control, National Cancer Institute. Cancer Prevention and Control Br, Div of Chronic Disease Control and Community Intervention, Center for Chronic Disease Prevention and Health Promotion; Div of Surveillance and Epidemiologic Studies, Epidemiology Program Office, CDC.

Editorial Note: Colorectal cancer mortality continues to decline in spite of increasing incidence. Detection of disease at an earlier stage might account for some of the increase in the survival rate (*2*). An indicator for early detection of colorectal cancer is the increased percentage of colorectal cancer diagnosed in the in situ and localized stages and the decrease in the percentage of distant disease.

The effectiveness of colorectal cancer screening by endoscopy is not well established (*3–5*). Sigmoidoscopy and colonoscopy are of potential use in detecting and removing precancerous colorectal polyps and in preventing severe morbidity and mortality by earlier detection of colorectal cancer. The effectiveness of stool blood screening in reducing colorectal cancer mortality has not been conclusively demonstrated (*6*). However, this noninvasive and relatively inexpensive technique appears to detect a higher proportion of colorectal cancers at earlier stages than are detected through symptomatic presentation (*7*).

In the absence of proven detection methods, recommendations vary for screening persons without symptoms or without family histories of colorectal cancer. The American Cancer Society recommends annual digital rectal examination for all adults ≥40 years of age, annual stool blood tests, and screening sigmoidoscopy every 3–5 years for adults ≥50 years of age (*8*). Other organizations have formulated similar recommendations (*9*). All groups concur on the greater use of sigmoidoscopic and stool blood screening among persons with symptoms or family histories of colorectal cancer. Because of the median age of patients and the influence of age at diagnosis on survival (*2*), screening programs might focus on the older population.

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Colorectal Cancer Trends — Continued

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The data in this report are provisional, based on weekly reports to CDC by state health departments. The reporting week concludes at close of business on Friday; compiled data on a national basis are officially released to the public on the succeeding Friday. The editor welcomes accounts of interesting cases, outbreaks, environmental hazards, or other public health problems of current interest to health officials. Such reports and any other matters pertaining to editorial or other textual considerations should be addressed to: Editor, *Morbidity and Mortality Weekly Report*, Centers for Disease Control, Atlanta, Georgia 30333; telephone (404) 332-4555.

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